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November 22, 1999

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Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
445 Twelfth Street – The Portals
12th Street Lobby – TW-A325
Washington, DC 20554

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NOV 22 1999
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Re: MicroTrax Petition for Rulemaking

Dear Ms. Salas:

MicroTrax, by counsel and pursuant to Section 1.401 of the Commission's rules, hereby submits its attached Petition to the Federal Communications Commission to commence a rulemaking proceeding for the purpose of allocating a series of bands of electromagnetic spectrum made available to it by the Federal government pursuant to Title III of the Balanced Budget Act of 1997 (BBA-97), and to establish a personal location and monitoring service to which some of the spectrum will be dedicated.

Should you have questions with respect to this Petition or desire additional information, kindly contact the undersigned at your convenience.

Sincerely,


Gregg P. Skall

Enclosure

cc: Chairman William E. Kennard
Commissioner Susan Ness
Commissioner Harold Furchtgott-Roth
Commissioner Michael K. Powell
Commissioner Gloria Tristiani

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Before the
Federal Communications Commission
Washington, D.C. 20554

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NOV 22 1999

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of)
Allocation of Electromagnetic Spectrum)
Pursuant to Title III of the Balanced)
Budget Act of 1997)
Amendment of Part 90 of the Rules to)
Establish a New Sub Part Y –)
Personal Location and Monitoring Service)

OET Docket No.

RM No.

To: The Commission

PETITION FOR RULEMAKING

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November 22, 1999

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SUMMARY

MicroTrax ("MicroTrax™") by counsel and pursuant to Section 1.401 of the Commission's Rules, hereby petitions the Federal Communications Commission to commence a rulemaking proceeding for the purpose of allocating a series of bands of electromagnetic spectrum made available to it by the Federal Government pursuant to Title III of the Balanced Budget Act of 1997 (BBA-97), and to establish a new Personal Location and Monitoring Service to which some of this spectrum will be dedicated.

MicroTrax™ represents a technology that will provide location, tracking and monitoring so effectively and at such reasonable cost that it can be deployed for applications affecting every day situations confronted by individual consumers and small businesses. Among these applications Enhanced 911 location identification for wireless telephone users; asset tracking of items as small and portable as a woman's purse or a youngster's bicycle; improved offender monitoring; child monitoring and tracking; and even pet tracking. These services would be made possible by new location products and services enabled by miniature, low cost devices. None of these services can be offered without an appropriate spectrum allocation to support them.

MicroTrax™ has identified a number of frequency bands that await Commission action. Microtrax™ believes that allocation of the spectrum as proposed will permit users to provide a new level of convenience, security and safety to individuals and small businesses in need of spectrum support. Accordingly, MicroTrax™ urges the Commission to issue a comprehensive rule making that would encompass all of the available bits and pieces of spectrum waiting to be allocated and assigned.

MicroTrax™ has evaluated each potential block of spectrum and proposes power limits, adjacent band limits and use restrictions for each of them, together with some additional comments on other technical requirements. Since the bands at issue are largely drawn from areas of government spectrum in which there will be continuing government operation for some time as well as government operation in adjacent bands, MicroTrax™ has attempted to place a premium on interference minimization.

MicroTrax™ believes that nationwide licenses are most appropriate form for this service. Should the Commission choose to license this service in smaller geographic regions, MicroTrax™ proposes that the Commission use of auctions for spectrum assignment through use of combinatorial bidding techniques. MicroTrax™ believes that use of such techniques will allow licensees to add maximum value to the bits and pieces of spectrum made available and to innovatively create a package of spectrum best suited to their unique needs.

Before the
Federal Communications Commission
Washington, D.C. 20554

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To: The Commission

PETITION FOR RULEMAKING

I. INTRODUCTION

MicroTrax ("MicroTrax™") by counsel and pursuant to Section 1.401 of the Commission's Rules, hereby petitions the Federal Communications Commission to commence a rule making proceeding for the purpose of allocating a series of bands of electromagnetic spectrum made available to it by the Federal Government pursuant to Title III of the Balanced Budget Act of 1997 (BBA-97), and to establish a new Personal Location and Monitoring Service to which some of this spectrum will be dedicated.

While most of the remaining unallocated spectrum that is the subject of this petition is composed of relatively small bands of contiguous frequencies, its rapid deployment will serve the public interest. There are several prospective applicants, including MicroTrax™, anxious to apply for licenses and who would propose creative new spectrum dependent, beneficial uses to which these remaining Government transferred bands could be applied. MicroTrax™ has identified several bands awaiting allocation and assignment that could be useful to its proposed application. Accordingly, in addition to requesting an immediate allocation, by this petition it is also proposing the creation of a new Personal Location and Monitoring Service and submits proposed rules for adoption by the Commission.

MicroTrax™ is a joint venture in the process of formation of Harris Corporation and Venture First Associates, both of Melbourne, Florida. Harris Corporation's many contributions to the state of the art of wireless technology are well known to the Commission.¹ MicroTrax™

¹ Harris is an international communications equipment company focused on providing product, system and service solutions to its customers. The company provides a wide range of products and services for commercial and government communications markets such as wireless, broadcast, government and network support. The company

represents a new venture formed to develop private sector applications of Harris research technologies and to commercialize them, thereby bringing the benefits they offer to average citizens at reasonable cost. MicroTrax™ technology requires a moderate size band of spectrum on a semi-exclusive or exclusive basis. It is for this reason that MicroTrax™ urges the Commission to proceed swiftly to the allocation and assignment of these spectrum bands it has identified.

II. SPECTRUM

MicroTrax™ is convinced that it is not alone as a developer of new technology applications poised to bring a new level of convenience, security and safety to individuals and small businesses in need of spectrum support. Accordingly, MicroTrax™ urges the Commission to issue a comprehensive Notice of Proposed Rulemaking that would encompass all of the available bits and pieces of spectrum waiting to be allocated and assigned. As will be later explained, MicroTrax™ urges the use of auctions for assigning the spectrum employing combinatorial bidding techniques. MicroTrax™ believes that the public interest would be best served by licensing this spectrum in nationwide bands. As we have already seen in the mobile telephone industry strong economic forces push towards the offering of integrated nationwide services. Nationwide licenses would permit rapid and efficient development of such nationwide services. Should the Commission not choose to grant nationwide licenses, we recommend the use of combinatorial bidding. Combinatorial bidding would allow users to add maximum value to the bits and pieces of spectrum made available from the government sector to innovatively create a package of spectrum best suited to their unique needs. This would be necessary because there are many individual bands of spectrum that may not be useful alone, but which may be quite satisfactory when combined with another band.

MicroTrax™ has identified the following bands awaiting Commission action. While many of these bands are subject to scheduled Government abandonment or reallocation dates, and others will be used on a shared basis with government, entrepreneur development schedules require that the spectrum issues be resolved now. The reallocation schedules and any criteria limiting their use may be found in the NTIA publication, Spectrum Reallocation Report.² The spectrum blocks are:

- **1385-1390 MHz** - Currently utilized by high-powered FAA and DOD radars.
- **1390-1400 MHz** - Currently utilized for DOD radar, tactical radio relay, fixed microwave and aeronautical mobile systems.

has sales and services in nearly 90 countries. Within the wireless market, Harris supplies a wide range of digital microwave radios, wireless local loop telephony systems, broadband wireless access products, secure communications systems, and military radios. Customers range from those engaged in providing telecommunications and cellular/PCS services to defense, air traffic, and law enforcement markets. Further information about Harris can be found at the company's web site <http://www.harris.com>.

² Spectrum Reallocation Report, Response To Title III Of The Balanced Budget Act Of 1997, U.S. Department Of Commerce, NTIA Special Publication 98-36, February 1998.

- **1427-1432 MHz** - Currently used by DOD for radar, tactical radio relay, fixed microwave and aeronautical mobile systems.

- **1432-1435 MHz** - Currently used by the military for tactical radio relay communications, military test range aeronautical telemetry and telecommand, and various types of guided weapons systems.

- **1670-1675 MHz** - Currently used by meteorological equipment that will have to be redesigned or replaced. The Spectrum Reallocation Report states that the band has potential for a new non-federal fixed or mobile communications; however, airborne or space-to-earth communications should be avoided.

- **1710-1755 MHz** - Currently being used by DOD for radar, tactical radio relay, fixed microwave and aeronautical mobile systems. While, with 45 MHz, it is a large band, continuing protection will be required for sites across the United States at which essential operations continue to be conducted by the federal government, as in the 1390-1400 MHz, 1427-1432 MHz and 4635-4660 MHz bands. However, in 1710-1755 MHz band, a more stringent requirement is imposed to protect essential operations at certain sites listed in Appendix F on page F-4 of the Spectrum Reallocation Report. Because of the large band here involved, and because many of the other bands are 5 MHz wide, MicroTrax™ believes that the 1710-1755 MHz band should be divided into 9 blocks of 5 MHz. Were the Commission to adopt the combinatorial method of bidding, it might facilitate obtaining the highest value, both in dollars and in terms of the most economical use. Bidders would be able to create their own combination of spectrum blocks for paired or unpaired use, for combining with spectrum in other regions, or for creating a contiguous block of spectrum custom sized to the actual need of their technology. Portions of the band not needed and therefore not included in the combinatorial bid would be made available for other applications.

- **1990-2110 MHz** - This block of 20 MHz is used by the federal government for space research and exploration. Recognizing that its continued use may be of vital interest of the United States, Congress permitted the President to identify other frequencies for reallocation should it be determined that this block cannot be reallocated due to the need to protect incumbent federal systems from interference. The Administration has exercised this option.³ NTIA recommended that the Commission assign by auction any of four alternate 15-megahertz bands.⁴ MicroTrax™ urges the FCC and NTIA to confer expeditiously to select the substitute spectrum so that it can be included in the same rule making and auction procedures we are requesting.

- **2110 – 2150 MHz** - BBA-97 directed the Commission to assign by competitive bidding no later than September 30, 2002, a total of 55 megahertz of non-Government spectrum, and further directed the Commission to reallocate the 2110-2150 MHz band and 15 megahertz from the 1990-2110 MHz band for this purpose. The

³ See NTIA, *Identification of Alternate Bands*, NTIA Special Pub. 98-39 (1998).

⁴ See *id.* at iii.

Commission has proposed to reallocate the 2110-2150 MHz band to the Fixed and Mobile Services, for assignment of licenses by auction.

- **2300-2305 MHz** - This band of 5 MHz is located adjacent to and immediately below the new WCS band. To protect government deep space network receivers at 2290-2300 MHz, operation of airborne or space-to-earth links must be prohibited, and emission in this lower adjacent band must be highly suppressed. On the upper side, WCS operations must be protected and there is also likely to be a requirement to protect the DARS transmissions located above the WCS band.

- **2385-2390 MHz** - This spectrum is found in an important region well suited for early development and implementation of new, state-of-the-art commercial products and services. It is close to the new WCS band where development efforts are already underway. Of concern, however, is that it is immediately adjacent to airborne telemetry systems and therefore requires that mandatory commercial receiver and transmitter standards be implemented to reduce the potential for mutual adjacent band interference.

- **4635-4660 MHz** - This is another region where DOD operates extensive networks of radar, tactical radio relay, fixed microwave and aeronautical mobile systems. In this band, federal airborne operations at certain specific locations will continue and must be protected for a period of 14 years.

The foregoing bands are those MicroTrax™ found to be of special interest for early implementation by the private sector. Other spectrum is also mentioned in the NTIA's Spectrum Reallocation Report.

III. PROPOSED TECHNICAL RULES FOR BANDS

Given the environment in which users of any of the aforementioned bands will be required to exist, MicroTrax™ believes that the Notice of Proposed Rule Making must contain appropriate restrictions and technical specifications for use specific to each of the bands when they are finally assigned. Adequate notice to potential bidders and users in the NPRM will provide an opportunity for public comment on the suggested technical parameters of use of each band. MicroTrax™ has evaluated each potential block of spectrum and in the following tables, suggests power limits, adjacent band limits and use restrictions for each of them, together with some additional comments on other technical requirements.

First, MicroTrax™ believes that the Commission should impose a power limitation on these bands of four watts, including any antenna gain. This limitation is compatible with low-cost equipment, personal operation, longer battery life, and low emissions into adjacent bands. MicroTrax™ believes that low cost personal telecommunications is the area of technology in greatest need of spectrum support. Providing that support will foster innovation and competition in this area, provided the Commission makes clear that it is developing a seedbed of spectrum for the low cost personal telecommunications. Limiting the power of equipment to be authorized in these bands is to allow those seeds to germinate.

These bands are largely drawn from areas of government spectrum in which there will be continued government operation for various periods of time. In many cases there will also be continued government operation in adjacent bands. Accordingly, MicroTrax™ believes it important to provide a standard that will allow for good neighbors between the new services that will occupy the spectrum and their government neighbors and, just as importantly, between new civilian, non-government users themselves. Accordingly, from the beginning it is important to establish a general adjacent band interference standard that will be understood by everyone. For this purpose, MicroTrax™ recommends an adjacent band interference standard on any frequency outside of the authorized bandwidth of $55+10\log(P)$ dB, where (P) is the highest emission in watts of the transmitter inside the authorized bandwidth.

To properly measure the out of band emissions, the resolution bandwidth of the instrumentation used to measure power should be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz should be used for measurement of center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth should not be less than the resolution bandwidth. Emission power should be measured in peak values.

Finally, as noted above and discussed below, MicroTrax™ proposes a peak power limit of 4 watts for all of these new bands. However, certain of these bands should be selected for allocation to the proposed Personal Location and Monitoring Service. These bands should be even more power restricted and MicroTrax™ proposes a maximum of 0.25 watts *average power* limit over a 60-second time interval. Using an average power standard would protect against the situation where a number of mobiles might congregate such that their combined emissions would exceed the permissible out-of-band limit. Thus, over a one-minute interval, the averaged transmitted power from any one Personal Location and Monitoring Service mobile unit would be only $1/16^{\text{th}}$ the peak power limit of 4 Watts.

Proposed Technical Rules for Bands

Band	1385-1390
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	No airborne or space-to-earth transmissions in order to protect radio astronomy in 1400-1427 MHz.
Other	Systems must be designed to tolerate interference from high-power government radars operating below 1670 MHz.

Band	1390-1400
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	No airborne or space-to-earth transmissions in order to protect radio astronomy in 1400-1427 MHz.
Other	Systems must be designed to tolerate interference from high-power government radars operating below 1670 MHz.

Band	1427-1432
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	No airborne or space-to-earth transmissions in order to protect radio astronomy in 1400-1427 MHz.

Band	1432-1435
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	No airborne or space-to-earth transmissions in order to protect radio astronomy in 1400-1427 MHz.

Band	1670-1675
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	No airborne or space-to-earth transmissions in order to protect radio astronomy in 1400-1427 MHz.
Other	Systems must be designed to tolerate interference from high-power government radars operating in the lower adjacent band. That is, system designs must be sufficiently robust, error-tolerant or adaptive that continued operation of the current high-power government radars will not create harmful interference. Licensee must protect meteorological satellite downlinks and the radiosonde downlinks in the upper adjacent band.

Band	2110-2150
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	
Other	Systems must be designed to tolerate interference from MDS transmitters operating in the upper adjacent band.

Band	2300-2305
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency below 2300, signals must be attenuated by $70+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth. On any frequency above 2305 and below 2320 MHz, or above 2345 MHz and below 2370 MHz, signals must be attenuated by $43+10\log(P)$ dB. On any frequency above 2320 MHz and below 2345 MHz, signals must be attenuated by $110+10\log(P)$ dB.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p>
Use restrictions	No airborne or space-to-earth transmissions in order to protect radio astronomy in 1400-1427 MHz.
Other	Systems must be designed to tolerate interference from high-power government radars operating in the lower adjacent band.

The 2300 – 2305 MHz band warrants special comment. MicroTrax™ proposes that the out of band emission limits stated above for frequencies above 2320 MHz and below 2345 MHz be relaxed for low duty cycle, short frame length transmitters which are not likely to cause harmful interference to DARS. Additionally, the attenuation requirement for adjacent channel protection on the down side, i.e. below 2300 MHz is by any estimation a drastic protection requirement. MicroTrax™ believes that the band could be made inhabitable were the government to allow some gradual sloping toward the $70+10\log(P)$ dB level rather than requiring that it be met immediately at the edge of the band. MicroTrax™ therefore, requests that the FCC consult with the National Telecommunications and Information Administration and the Interdepartmental Radio Advisory Committee (IRAC) to determine whether sloped criteria could be adopted. Clearly, MicroTrax™ proposes a very restrictive emission limit and sloping to the guard band protection limit might make this otherwise unusable band usable after all.

Band	2385 -- 2305
Power limits	4 Watts including any antenna gain.
Adjacent band limits	<p>On any frequency outside of the authorized bandwidth: $55+10\log(P)$ dB where (P) is the highest emission (watts) of the transmitter inside the authorized bandwidth.</p> <p>The resolution bandwidth of the instrumentation used to measure the emission power shall be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.</p> <p>Commercial transmitters and receivers must meet standards to protect against mutual interference with adjacent band airborne telemetry systems.</p>
Use restrictions	No airborne or space-to-earth transmissions in Puerto Rico
Other	

Finally, we have not proposed technical rules for two bands listed in Section II above. The 1710 – 1755 MHz and 2110 – 2150 MHz bands are so broad that many alternative scenarios are possible for their allocation and deployment. MicroTrax™ believes these bands could be most useful to the greatest variety of applications were they divided into 5 MHz blocks and placed out for bidding so that any applicant could design a bidding strategy to obtain only as much of the band as it requires for its proposed service. Were combinatorial bidding permitted here, a bidder requiring broadband capability could assure itself of obtaining what it needs without having to buy too much, leaving the “leftovers” for others who need only that much.

Also, no rules are suggested for the 4635 – 4660 MHz band. This spectrum is simply too high for any applications of potential benefit to MicroTrax™ and we have not, therefore studied it.

IV. MICROTRAX™ SERVICE

MicroTrax™ represents a technology that will provide location, tracking and monitoring so effectively and at such reasonable cost that it can be deployed for applications affecting every day situations confronted by individual consumers and small businesses. Among these applications could be Enhanced 911 location identification for wireless telephone users; asset tracking of items as small and portable as a woman's purse or a youngster's bicycle; improved offender monitoring; child monitoring and tracking; and even

pet tracking. These services could be made possible by new location products and services enabled by miniature, low cost devices.

In a later section of this paper, MicroTrax™ will extend its discussion of these services and its proposal to create a personal location and monitoring service. However, none of these services can be offered without an appropriate spectrum allocation to support them. Accordingly, MicroTrax™ urges the Commission to issue a comprehensive Notice of Proposed Rule Making as quickly as possible proposing allocations for the series of bands we have identified as being available for this purpose.

V. PERSONAL LOCATION AND MONITORING SERVICE

MicroTrax™ has developed technology offering a new level of personal security and asset tracking that can be provided inexpensively to business and individuals alike. To operate maximally, the service should be provided on a nation-wide basis. MicroTrax™ believes that the need for such a service is so compelling that the Commission should establish a new Personal Location and Monitoring Service (PLMS) and certain of the above frequency bands should be reserved for those who would competitively bid to acquire spectrum to provide this service.

As only a few examples of the compelling need for a PLMS, MicroTrax™ offers the following. Based on U.S. Government data, it can be estimated that there were over 45,000 lost, missing or injured children under the age of 15 years in 1994, the most recent year figures available to MicroTrax™. In the same year, there were estimated over 4,000 nonfamily abductions and, according to the National Child Search Foundation, 114,600 attempted abductions by nonfamily members. According to the FBI, there were 720,000 missing children reported in 1992.

Alzheimer patients represent another group in need of PLMS. It is estimated that approximately 1.6% of the U.S. population has Alzheimer Disease (AD) or its symptoms. It is reported that approximately 10% of people over 65 and nearly 50% of people over 85 have AD. That represents 80,000 people in a five million population metropolitan area. PLMS could afford such people added freedom while comforting their loved ones that they can be easily and safely found. For those unable to afford the average of \$42,000 per year (and up to \$70,000 in some cases) annual cost of a nursing home for their AD afflicted loved ones, PLMS could provide a welcome assurance that living at home is an option for them.

Similar scenarios are easily imagined in the pet owner population. MicroTrax™ estimates a demand of between 15,000 and 50,000 PLMS tags in a metropolitan area of five million. That translates to a U.S. nationwide potential market of between 750,000 and 2,500,000 PLMS pet tags.

MicroTrax™ PLMS technology also presents the potential for solving the need for universal, cross platform resolution of the Enhanced 911 requirement for all mobile telephone providers.

Similarly, MicroTrax™ can improve the difficult task of offender monitoring. When a parolee or a person awaiting trial is required to have electronic monitoring, the current technology is limited to alerting authorities when the monitored person has left predefined vicinity. PLMS is

capable of providing location indoors or outside at anytime authorities need to know the monitored person's whereabouts.

There are many more potential applications for PLMS, such as ladies purses, children's bicycles, stolen autos and so on. One can quickly imagine new applications. The important point is that there is a need and there is a way for that need to be fulfilled, provided spectrum support is made available, and protected for such a service. To do so, the Personal Location and Monitoring Service should be defined to have the following characteristics:

- **Small enough to be body worn or hidden in small personal assets.** PLMS service providers should demonstrate that a substantial portion of the services they provide are for portable applications; i.e. something that can be worn by a person, rather than used in a vehicular, mobile application. Services primarily oriented to vehicular applications do not adequately serve the needs of many segments of the public. MicroTrax™ believes that low cost, personal safety and security services are desperately needed for children, the aged, the infirm and the nonaffluent for which vehicular application becomes a limiting factor. Other bands, such as the LMS bands, have been allocated to services primarily oriented to vehicular use. These other bands allow relatively high transmit power from the mobile (e.g. 30 Watts for LMS) which makes them quite useful in the vehicular context, but virtually unavailable to personal, portable services. PLMS devices must be sufficiently low in power usage that they may be safely "body worn" yet store sufficient power for long-term usefulness. Adopting such a service restriction would encourage the development of new and innovative personal use services. It might also encourage broader use of public mass transit due to the increased availability of portable personal safety and security services that are not tied to private vehicular use.

- **Can be located both indoors and outdoors without materially affecting performance.** Without this capability, the utility of any personal service is severely hampered. Therefore, the FCC must be careful to select frequencies that make this objective achievable.

- **Can provide location accuracy** that complies with the Enhanced 911 accuracy requirement of 125 meters or less using a Root Mean Square (RMS) methodology, as provided at Section 20.18 (e) of Part 20 of the Commission's Rules.. MicroTrax™ believes that this minimum standard is achievable and necessary to provide a truly useful service.

- **Service must be offered Nationwide.** To qualify as nationwide, the service must achieve coverage for 25 metropolitan areas with a combined population of 150 million people within 5 years. The service must be offered nationwide because stolen or lost assets are often quickly transported away from the owner or the owner may be on the move. In either case, a local-only service would be of limited value and could wastefully use spectrum otherwise required for a viable nationwide service. Moreover, a nationwide service is necessary for the protection of small children or pets, whose kidnappers frequently transport them hundreds of miles from the site of abduction. Similarly, the use of devices in the Personal Location and Monitoring Service for offender monitoring would require nationwide application to be effective in locating offenders who have violated their travel restrictions.

- **The service should be limited to terrestrial based systems.** Terrestrial systems offer the greatest potential for providing low cost service within the reach of users for individual applications capable of working while deep within buildings or when hidden in assets or body worn. Mixing terrestrial and space-based applications would pose a potential for destructive interference while losing the location ubiquity available with terrestrial services. A terrestrial system allows for low power applications with scalable receive sites capable of providing nearly limitless locates per day. Moreover, adequate spectrum has already been allocated for satellite radiolocation type services. In this case, a terrestrial limitation will actually foster innovation and competition.

- **Transmission of voice must be prohibited.** There has already been a multitude of bands and resulting communications services made available for voice. The contemporary user has The Cellular Telephone Service, Personal Communications Service (PCS), Business Radio, Specialized Mobile Radio Service (SMRS) and many others to choose from for this purpose. The availability of spectrum for those services has already spawned a host of innovative services capable of providing voice communications. Restricting voice in these limited size bands would foster similar innovation in a location and tracking service.

- **Transmission of data must be restricted to that associated with monitoring the location, security, or safety of the person or property associated with the device.** Similarly, this restriction would foster innovation and development for a badly needed, but overlooked service. Other spectrum bands, such as LMDS and MMDS, have been allocated for video and data services. Paging and some satellite systems have been designated for data distribution. This restriction would allow the development and implementation of spectrum for new and innovative location and tracking services.

With an appropriate allocation of spectrum and a useful service definition, the Personal Location and Monitoring Service can be used for a variety of badly needed new applications and can improve upon the performance for some existing ones. New examples of applications not addressed by other technologies include child monitoring and locating lost personal possessions. Other services or technologies do not address these personal applications either because they would be cost prohibitive or the technology is not adaptive to conditions for personal use. MicroTrax™ believes that it and others can provide such services affordably to those of even modest households if given the opportunity to acquire adequate spectrum support. By embedding technology into cellular telephones, PLMS has the ability to provide one, seamless, cross-platform technological solution for Enhanced 911. But, to realize the full potential of the intended Personal Location and Monitoring Service, MicroTrax™ believes that a qualified provider must offer all three of the following capabilities to qualify for the service, and MicroTrax™ is prepared to do so:

- **Locally commanded locator-tracker:** At least one type of mobile unit must be able to be activated or controlled locally by the user.

- **Remotely commanded locator-tracker:** At least one type of mobile unit must be able to be activated or controlled remotely by a user trying to locate the person or property being monitored.

- **Embedded Location and Tracking:** The capability to integrate personal location and monitoring technology into other applications, such as cellular telephones, PCS devices and pagers.

The potential benefit to society of a Personal Location and Tracking Service seems so obvious that the Commission should take steps to ensure that those who would offer the service are not precluded by lack of spectrum. Therefore, MicroTrax™ proposes a short list of frequency bands that would be useful for the PLMS. Ideally, all of these should be allocated to PLMS, thus allowing for broad completion among multiple providers. Practically, however, at least two or three of these bands should be reserved to those bidders who would offer a service that meets the above description:

- A. **1385 – 1390 MHz** This is less desirable than the following 1390 – 1400 MHz band. However, the AHA proposed it for Medical Telemetry, and if the FCC ultimately allocates 1390 – 1400 MHz to Medical Telemetry, then PLMS could reside at this location.
- B. **1390 – 1400 MHz** This would be an effective band for PLMS in Regions 1 and 2 where it is already primary for radiolocation and airborne and space to earth links are already prohibited. PLMS would be a good neighbor to the immediately adjacent radio astronomy band. There is sufficient bandwidth here so that a 7 MHz allocation could be made, providing for enhanced accuracy. This band would provide an excellent balance of propagation and building penetration, both important for an effective PLMS.
- C. **1427 – 1432 MHz** This band provides a good compromise for PLMS between the dual goals of propagation and building penetration. It is likely compatible with the need for moderate component costs. Systems can be designed to be compatible with government neighbors.
- D. **1670 – 1675 MHz** This band provides a good compromise for PLMS between the dual goals of propagation and building penetration. It is likely compatible with the need for moderate component costs. Systems can be designed to be compatible with government neighbors.
- E. **2300 – 2305 MHz** MicroTrax™ believes that PLMS may be able to use this band effectively while meeting the stringent adjacent channel interference restrictions required to protect the Government Deep Space Network receivers on the lower side and the WCS and satellite DARS allocations on the upper side of the band. As suggested earlier, however, some sloping of the out of band emission requirement in the immediately adjacent lower band may be necessary to allow for economically feasible implementation.

- F. **2385 – 2390 MHz** This band may be usable for PLMS, however, additional data is required regarding the emissions profiles of Government systems in the immediately adjacent lower band.

MicroTrax™ recognizes that the Commission has proposed portions of 1390 – 1400 MHz and 1427 – 1432 MHz for Medical Telemetry and that others have expressed interest in these bands.⁵ However, it also notes that the AHA actually requested 1385 – 1390 MHz and 1432 – 1435 MHz. While MicroTrax™ can envision arguments for granting the AHA Medical Telemetry allocations as they requested, MicroTrax™ would make the point that in either scenario, two 5 MHz bands are left for allocation to PLMS.

VI. AUCTION METHOD

The Commission's auction authority derives from the Omnibus Reconciliation Act of 1993, whereby Congress granted discretionary authority to auction spectrum subject to mutually exclusive application. In the Second Report and Order, 9 FCC Rcd. 2348 (1994), in the context of the PCS/Auction, the Commission discussed different methods for conducting auctions. Generally, the Commission established four such methodologies:

- simultaneous multiple round auctions, using remote and/or on-site electronic bidding;
- sequential multiple round auctions, using either oral ascending, remote or on-site electronic bidding;
- sequential or simultaneous single round auctions, using either remote and/or on-site electronic bidding, or sealed bids; and
- combinatorial bidding.

Further, the Commission determined that each service for which spectrum would be auctioned is sufficiently distinct as to require a separate analysis to adopt the proper auction methodology. MicroTrax™ strongly believes that an effective PLMS requires a nationwide license and that spectrum auctioned for the purpose of establishing a PLMS should be offered on a nationwide coverage basis.

Should the Commission choose, however, to license this service in smaller geographic regions, MicroTrax™ then strongly requests that the Commission do so using of combinatorial bidding techniques. Such techniques will allow users to add maximum value to the bits and pieces of spectrum made available and to innovatively create a package of spectrum best suited to their unique needs. Most importantly, it would allow bidders such as MicroTrax™ more effectively to seek a nationwide capability. Notably, even though combinatorial bidding has not yet been used, the Commission recognized the very benefit we seek in its discussion beginning at paragraph 99:

⁵ See: *Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service*, ET Docket 99-255, FCC 99-182, Released, July 16, 1999, at ¶ 13 *et. seq.*

99. **Advantages of Combinatorial Bidding.** Combinatorial bidding may promote efficient aggregation of licenses that are worth more as a package than individually. It may also simplify bidding strategy since bidders can avoid the problem of determining how to allocate the added value of a package among individual bids. Without combinatorial bidding, bidders risk paying too much for part of a desired package while losing the rest of the package to other bidders. The magnitude of this exposure depends on the specifics of the auction design and the value bidders put on various packages of licenses. This exposure is greater in a sequential auction than a simultaneous auction because bidders have less information about the likely prices of complementary licenses. It is also greater the more severe the consequences of bid withdrawal. Exposure risk is greatest when the value of a package is severely diminished by the absence of a single part. Finally, the risk of exposure is greater when bidders do not agree on how licenses should be combined. When bidders generally want the same packages of licenses, if a firm is outbid on part of a package it is likely to be outbid on the entire package, and thus not likely to be stuck holding a piece of a package that is of little value without the rest of the package. (Emphasis added)


VII. CONCLUSION

MicroTrax™ respectfully submits that issuance of the Notice of Proposed Rulemaking furthers the public interest in the rapid deployment of currently available, unallocated spectrum available for specialized applications. Furthermore, issuance of the Notice of Proposed Rulemaking will further the public interest in the availability of services not heretofore available to the average consumer at reasonable cost.

Wherefore, the premises considered, MicroTrax™ respectfully requests that Commission commence a rule making proceeding as proposed herein.

Respectfully submitted,

MICROTRAX™

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PROPOSED RULES

PART 90

SUBPART - Y

PERSONAL LOCATION AND MONITORING SERVICE (PLMS)

90.1201 SCOPE

This subpart sets out the regulations for the Personal Location and Monitoring Service (PLMS).

90.1202 DEFINITIONS

(a) **Average Transmit Power.** The average power obtained by multiplying the Peak Transmit Power by the fraction of time that the transmitter is on during any continuous 60-second interval.

(b) **Embedded User Device:** A mobile PLMS User Device capable of being integrated with other devices or applications, such as cellular telephones, PCS devices and pagers.

(c) **Emission bandwidth.** For purposes of this subpart, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(d) **Locally Commanded User Device:** A mobile PLMS User Device that is capable of initiating the location and monitoring function in response to a stimulus created within the immediate vicinity of the user device, or capable of activating or controlling itself.

(e) **Peak Transmit Power.** The peak power output of a transmitter as measured over an interval of time equal to the frame rate or transmission burst of the transmitter under all conditions of modulation. Usually this parameter is measured as conducted emission by direct connection of a calibrated test instrument to the equipment under test. If a direct connection cannot be achieved, alternative techniques acceptable to the Commission may be used. Peak Transmit Power must be measured using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity,

etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

(f) **Personal Location and Monitoring Service (PLMS).** The use of non-voice signaling methods to locate or monitor any legal entity, person or property. PLMS systems may transmit and receive only nonvoice transmissions and instructional information related to such units.

(g) **Personal Location and Monitoring Service User Device (PLMS User Device)** [Unlicensed]. Mobile or portable intentional radiators operating in the frequency bands _____ MHz that provide a wide array of mobile location and tracking communication services as defined by the provisions of this Subpart Y.

(h) **Portable Application.** PLMS Service offered through a PLMS User Device that can be worn by a person and hidden from plain view, rather than used in a vehicular, mobile application.

(i) **Remotely Commanded User Device:** A PLMS User Device capable of being activated or controlled by commands received from a person or entity away from the PLMS User Device trying to locate or monitor a person or property in the immediate vicinity of the PLMS User Device.

90.1203 EQUIPMENT AUTHORIZATION REQUIREMENT

(a) PLMS devices operating under this subpart shall be Verified under the provisions of Subpart J of Part 2 of this chapter before marketing.

90.1204 GENERAL TECHNICAL REQUIREMENTS

(a) The ____ - ____ MHz band is limited to use by PLMS service providers and devices under the requirements of this Part.

(b) Average Transmit Power of a transmitter operating pursuant to this subpart shall not exceed 0.25 watts.

(c) Adjacent Channel Limit

i. Out of band emissions in any 1 MHz bandwidth must be attenuated below P by $55+10\log(P)$ dB where (P) is the Peak Transmit Power in Watts of the transmitter inside the authorized bandwidth.

ii. The resolution bandwidth of the instrumentation used to measure the emission power must be 100 kHz, except that a minimum spectrum analyzer resolution bandwidth of 300 Hz must be used for measurement center frequencies within 1 MHz of the edge of the authorized sub-band. If a video filter is used, its bandwidth shall not be less than the resolution bandwidth. Emission power shall be measured in peak values.

(d) A PLMS device must comply with IEEE C95.1-1991, (ANSI/IEEE C95.1-1992), "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." Measurement methods are specified in IEEE C95.3-1991, "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave." Copies of these standards are available from the IEEE Standards Board, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855-1331. Telephone 1-800-678-4333. All equipment shall be considered to operate in an "uncontrolled" environment. The application for certification must contain a statement confirming compliance with IEEE C95.1-1991. Technical information showing the basis for this statement must be submitted to the Commission upon request. The ANSI/IEEE standard uses the term "radiated power" as meaning the input power to the antenna.

90.1205 PLMS Device Requirements

PLMS Devices may be operated only as part of a PLMS system that complies with the following characteristics:

(a) **Size:** PLMS services providers must demonstrate that a substantial portion of the services they provide are for Portable Applications in which the PLMS User Devices are small enough to be body worn or hidden in small personal assets.

(b) **Location:** PLMS services providers must demonstrate the ability to locate User Devices that are located indoors or outdoors without materially affecting performance.

(c) **Accuracy:** PLMS User Devices must provide location accuracy that complies with the Enhanced 911 accuracy requirement of 125 meters or less using a Root Mean Square (RMS) methodology, as provided at Section 20.18 (e) of Part 20 of the Commission's Rules.

(d) **Nationwide Service:** The service must achieve coverage for 25 metropolitan areas with a combined population of 150 million people within 5 years of the date service is first initiated. PLMS service providers must notify the Commission of their Service initiation date.

(e) **Voice:** Transmission of voice within the PLMS service is prohibited.

(f) **Data:** Transmission of data within the PLMS service is restricted to that associated with monitoring the person or property associated with the device.

90.1201 PLMS System Device Requirements

PLMS User Devices may be offered for use to the public only with a PLMS system that offers each of the following types of PLMS User Devices:

- (a) Locally Commanded User Device
- (b) Remotely Commanded User Device
- (c) Embedded User Device

CERTIFICATE OF SERVICE

I, Paula M. Lewis, a secretary in the law firm of Pepper & Corazzini, L.L.P., do hereby certify that on this 22nd day of November, 1999, copies of the foregoing "Petition for Rulemaking" were hand-delivered to the following:

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